PRD2008-04

Proposed Registration Decision

Pyraclostrobin

Insignia EG Fungicide
Headline EC Fungicide
Cabrio EG Fungicide

(publié aussi en français)

8 February 2008

This document is published by the Health Canada Pest Management Regulatory Agency. For further information, please contact:

Publications
Pest Management Regulatory Agency
Health Canada
2720 Riverside Drive
A.L. 6605C
Ottawa, Ontario
K1A 0K9

Internet: pmra_publications@hc-sc.gc.ca
www.pmra-arla.gc.ca
Facsimile: 613-736-3758
Information Service:
1-800-267-6315 or 613-736-3799
pmra_infoserv@hc-sc.gc.ca

Canada

ISBN: 978-0-662-46993-3 (978-0-662-47931-4)
Catalogue number: H113-9/2008-4E (H113-9/2008-4E-PDF)

Table of Contents

Overview

Proposed Registration Decision for Pyraclostrobin

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is proposing the following: conversion of the conditional registration of Pyraclostrobin Technical Fungicide, Headline EC Fungicide and Cabrio EG Fungicide to full registration, as well as full registration for the sale and use of Insignia EG Fungicide containing the technical grade active ingredient pyraclostrobin to control a variety of fungal diseases on golf course turf.

An evaluation of available scientific information determined that, under the approved conditions of use, these products have value and do not present an unacceptable risk to human health or the environment.

This Overview describes the key points of the evaluation, while the Science Evaluation provides detailed technical information on the human health, environmental and value assessments of Pyraclostrobin Technical Fungicide, Insignia EG Fungicide, Headline EC Fungicide and Cabrio EG Fungicide.

What Does Health Canada Consider When Making a Registration Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people and the environment from the use of pest control products. Health or environmental risk is considered acceptable[1] if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its proposed conditions of registration. The *Pest Control Products Act* also requires that products have value[2] when used according to label directions. Conditions of registration may include special precautionary measures on the product label to further reduce risk.

To reach its decisions, the PMRA applies modern, rigorous risk-assessment methods and policies. These methods consider the unique characteristics of sensitive subpopulations in humans (e.g. children) as well as organisms in the environment (e.g. those most sensitive to environmental contaminants). These methods and policies also consider the nature of the effects observed and the uncertainties present when predicting the impact of pesticides. For more information on how the PMRA regulates pesticides, the assessment process and risk reduction programs, please visit the PMRA's website at www.pmra-arla.gc.ca.

---

1 "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act*.

2 "Value" as defined by subsection 2(1) of the *Pest Control Products Act* is "the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (a) efficacy; (b) effect on host organisms in connection with which it is intended to be used; and (c) health, safety and environmental benefits and social and economic impact."

Before making a final registration decision on pyraclostrobin, the PMRA will consider all comments received from the public in response to this consultation document.[3] The PMRA will then publish a Registration Decision document[4] on pyraclostrobin, which will include the decision, the reasons for it, a summary of comments received on the proposed final registration decision and the PMRA's response to these comments.

For more details on the information presented in this Overview, please refer to the Science Evaluation of this consultation document.

What Is Pyraclostrobin?

Pyraclostrobin is the active ingredient in Headline EC Fungicide, Cabrio EG Fungicide and Insignia EG Fungicide. It is a fungicide applied to the foliage that is used to control a variety of fungal pathogens on plants. It has a protective effect by inhibiting spore germination and also a curative effect by inhibiting mycelial growth.

Headline EC Fungicide and Cabrio EG Fungicide control fungal pathogens in agricultural crops, as well as certain grasses. Insignia EG Fungicide controls numerous fungal diseases on golf course turf.

Health Considerations

Can Approved Uses of Pyraclostrobin Affect Human Health?

Pyraclostrobin is unlikely to affect your health when used according to label directions.

Exposure to pyraclostrobin may occur through diet (food and water), when handling and applying the product or when working in treated areas. When assessing health risks, two key factors are considered: the levels where no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (e.g. children and nursing mothers). Only those uses for which the exposure is well below levels that cause no effects in animal testing are considered acceptable for registration.

Toxicology studies in laboratory animals describe potential health effects from varying levels of exposure to a chemical and identify the dose where no effects are observed. The health effects noted in animals occur at doses more than 100-times higher (and often much higher) than levels to which humans are normally exposed when using pyraclostrobin products according to label directions.

---

[3] "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

[4] "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

Pyraclostrobin did not cause cancer in animals and was not genotoxic. There was also no indication that pyraclostrobin caused damage to the nervous system and there were no effects on reproduction. The first signs of toxicity in animals given daily doses of pyraclostrobin over long periods of time were effects on the gastrointestinal (GI) tract, liver and spleen. The risk assessment protects against these effects by ensuring that the level of human exposure is well below the lowest dose at which these effects occurred in animal tests.

When pyraclostrobin was given to pregnant animals, effects on the developing fetus were observed at doses that were toxic to the mother, though the effects observed were more severe, indicating that the fetus was more sensitive to pyraclostrobin than the adult animal. Consequently, extra protective measures were applied during the risk assessment to further reduce the allowable level of human exposure to pyraclostrobin.

Residues in Water and Food

Dietary risks from residues in food and water resulting from the use of Headline EC Fungicide and Cabrio EG Fungicide are not of concern.

Aggregate dietary intake estimates (food and water) revealed that the general population and children 1 to 2 years old, the subpopulation which would ingest the most pyraclostrobin relative to body weight, are expected to be exposed to less than 31.6% of the acceptable daily intake. Based on these estimates, the chronic dietary risk from pyraclostrobin is not of concern for all population subgroups.

Animal studies revealed acute health effects. The acute aggregate (food and water) dietary intake estimate for females 13 to 49 years of age used less than 92.8% of the acute reference dose, which is not a health concern.

The *Food and Drugs Act* prohibits the sale of adulterated food, that is, food containing a pesticide residue that exceeds the established maximum residue limit (MRL). Pesticide MRLs are established for *Food and Drugs Act* purposes through the evaluation of scientific data under the *Pest Control Products Act*. Food containing a pesticide residue that does not exceed the established MRL does not pose an unacceptable health risk.

Residue trials conducted throughout Canada and the United States using pyraclostrobin on banana, berries, bulb vegetables, cereal grains, citrus fruits, cucurbit vegetables, fruiting vegetables, grapes, succulent or dried legume vegetables, peanut, root and tuber vegetables, stone fruits, strawberries and tree nuts were acceptable. The MRLs for this active ingredient can be found in the Science Evaluation section of this consultation document.

Occupational Risks From Handling Pyraclostrobin

Occupational risks are not of concern when Insignia EG Fungicide, Headline EC Fungicide and Cabrio EG Fungicide are used according to label directions, which include protective measures.

For bystanders, exposure is expected to be much less than that of field workers and is considered negligible. Therefore, health risks to bystanders are not of concern.

Insignia EG Fungicide:

The label will specify that anyone mixing, loading or applying Insignia EG Fungicide or involved in clean-up or repair activities must wear a long-sleeved shirt, long pants, shoes, socks and chemical-resistant gloves, and that Insignia EG Fungicide is for application to golf course turf only. When using low pressure turf gun application equipment, mixers/loaders and applicators must also wear respiratory protection. Taking these label requirements into consideration, risk to workers handling Insignia EG Fungicide is not a concern.

Headline EC Fungicide and Cabrio EG Fungicide:

As a result of the evaluation of new data, the dermal and inhalation exposure and risk estimates for all uses currently on the labels for Cabrio EG Fungicide and Headline EC Fungicide were reassessed. The personal protective measures on the labels were updated accordingly. Taking the label requirements into consideration, risk to workers handling or exposed to areas freshly treated with Headline EC Fungicide or Cabrio EG Fungicide is not of concern.

Environmental Considerations

What Happens When Pyraclostrobin Is Introduced Into the Environment?

Pyraclostrobin is a risk to aquatic organisms; therefore, buffer zones are required to mitigate this risk during application.

Pyraclostrobin enters the environment when used as a fungicide on turf as well as agricultural crops. Based on its low volatility, pyraclostrobin residues are not expected in the air. Pyraclostrobin is persistent in aerobic soil and non-persistent in anaerobic soil. Neither hydrolysis or phototransformation is an important route of transformation for pyraclostrobin in terrestrial environments. Pyraclostrobin and its major transformation products are immobile in sediment; hence, leaching is not an important route of dissipation. Pyraclostrobin is not persistent in the aquatic environment. Phototransformation is an important route of transformation for pyraclostrobin in the aquatic environment and most major transformation products are transient. Hydrolysis of pyraclostrobin is not an important route of transformation in the aquatic environment.

Pyraclostrobin poses a very high risk to aquatic invertebrates, plants and fish. It also poses a high dietary risk and a moderate reproduction risk to small mammals.

Value Considerations

What Is the Value of Insignia EG Fungicide, Headline EC Fungicide and Cabrio EG Fungicide?

Insignia EG Fungicide

Used according to the label and with appropriate resistance management techniques, Insignia EG Fungicide provides effective control of a wide range of turfgrass diseases, including brown patch, gray leaf spot, gray snow mould/typhula blight, leaf spot, pink snow mould, pythium blight and rust.

There are many fungicides registered for control of turf diseases, including two others with a similar active ingredient (e.g. strobilurins). The addition of pyraclostrobin provides another strobilurin for turf disease management.

Headline EC Fungicide and Cabrio EG Fungicide

A value assessment of Headline EC Fungicide and Cabrio EG Fungicide was presented in Regulatory Note REG2003-06, *Pyraclostrobin, Headline EC, Cabrio EG.* Confirmatory efficacy data were required on chickpeas and potatoes for Headline EC and on one stonefruit crop for Cabrio EG to support aerial application for both of these products.

For Headline EC Fungicide, three trials on leaf spot diseases of wheat, four trials on potato early blight and two trials on ascochyta blight of chickpeas comparing aerial applications to ground applications were reviewed. None of the trials demonstrated an appreciable difference in efficacy between the two application methods. Therefore, aerial application of Headline EC Fungicide is fully supported for all labelled crops, with the exception of sugar beets. Since the upper rate range for sugar beets is higher than the rest of the label (0.9 L/ha vs 0.67 L/ha), buffer zones will be affected if applied by air, and therefore sugar beets will not be supported for aerial application at this time.

For Cabrio EG Fungicide, aerial trials were submitted on cucumbers and melons, but not on stonefruits. In addition, the product tested in these trials was not Cabrio EG Fungicide, but a different formulation of pyraclostrobin. The request for aerial application on the Cabrio EG Fungicide label was subsequently withdrawn.

Headline EC Fungicide is a broad spectrum foliar fungicide registered for use on cereals, corn, edible-podded vegetables, succulent shelled beans and peas, dried shelled peas and beans (including chickpeas, lentils and dry field peas), soybeans, potatoes, sugar beets and bluegrasses, fescues and rye grasses and alfalfa grown for seed production.

Cabrio EG Fungicide is a broad-spectrum foliar fungicide registered for use on blueberries (highbush, lowbush), bulb vegetables, cucurbit vegetables (field cucumber, gherkin, citron melon, muskmelon, pumpkin, summer and winter squash, watermelon), fruiting vegetables (eggplant, field pepper, field tomato), root vegetables (carrot, horseradish, oriental radish, radish, garden beet, rutabaga, turnip), stonefruits and strawberries.

Both Headline EC Fungicide and Cabrio EG Fungicide fit well into IPM strategies due to their strong activity on multiple diseases and their low risk to beneficial insects and arthropods. They can also be replacements for older fungicides through substitution of applications or elimination of sprays due to the longer residual effect of pyraclostrobin.

Measures to Minimize Risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human and environmental health. These directions must be followed by law.

The key risk-reduction measures proposed on the labels of Insignia EG Fungicide, Headline EC Fungicide and Cabrio EG Fungicide to address the potential risks identified in this assessment are as follows.

Key Risk-Reduction Measures

- **Human Health**

  Insignia EG Fungicide:
  Persons mixing, loading or applying Insignia EG Fungicide or performing clean-up or repair activities must wear a long-sleeved shirt, long pants, shoes, socks and chemical-resistant gloves. When using low pressure turf gun application equipment, mixers/loaders and applicators must also wear respiratory protection.

  For Headline EC Fungicide the label must be amended as follows:
  - Persons mixing/loading or involved in clean-up and repair activities with Headline EC Fungicide must wear a suitable respirator, goggles or face shield and coveralls over a long-sleeved shirt and long pants, socks and footwear. The respirator is not required for a farmer or commercial mixer/loader working with alfalfa for seed crop or for a farmer mixer/loader working with potato and sugar beet crops. Anyone applying Headline EC Fungicide must wear a long-sleeved shirt, long pants, gloves, socks and footwear. Gloves are not required for an applicator in an enclosed cab. Commercial applicators must use groundboom equipment with an enclosed cab.

  - Do not enter or allow workers entry into the areas treated with Headline EC Fungicide during the restricted-entry interval (REI) of 12 hours except in the case of corn, for which the REI is 7 days for hand harvesting or detasseling activities.

For Cabrio EG Fungicide the label must be amended as follows:

- Anyone mixing/loading, applying or involved in clean-up or repair activities with Cabrio EG Fungicide must wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and footwear. In addition, custom commercial mixers/loaders working with root vegetables must wear a respirator while mixing and loading for up to 100 ha. For mixing/loading and applying to more than 100 ha of root vegetables, a closed mixing, loading and application system must be used.

- Do not enter or allow workers entry into treated areas for the following restricted-entry intervals specified for each crop:

lowbush berries, fruiting vegetables and strawberries:	12 hours for all activities
highbush berries:	28 days for hand harvesting and 12 hours for all other activities
bulb vegetables:	3 days for thinning and 12 hours for all other activities
cucurbit vegetables:	3 days for hand harvesting, thinning and pruning and 12 hours for all other activities
root vegetables:	3 days for hand harvesting and 12 hours for all other activities
stone fruits:	9 days for hand thinning and pruning and 12 hours for all other activities

- **Environment**

Insignia EG Fungicide:
To protect sensitive aquatic and terrestrial habitats from the use of pyraclostrobin, mitigative measures are recommended. These include adding precautionary statements to the label regarding environmental hazards and the directions for use, as well as buffer zones to protect sensitive aquatic and terrestrial habitats from spray drift. Therefore, buffer zones of 1 to 20 metres for ground application are required to protect nearby freshwater, estuarine/marine and terrestrial habitats from the effects of spray drift.

Next Steps

Before making a final registration decision on pyraclostrobin, the PMRA will consider all comments received from the public in response to this consultation document. The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (contact information on the cover page of this document). The PMRA will then publish a Registration Decision document, which will include its decision, the reasons for it, a summary of comments received on the proposed final decision and the Agency's response to these comments.

Other Information

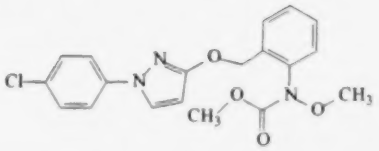
At the time the PMRA makes its registration decision, it will publish a Registration Decision document on pyraclostrobin (based on the Science Evaluation of this consultation document). In addition, the test data referenced in this consultation document will be available for public inspection, upon application, in the PMRA's Reading Room (located in Ottawa, Ontario).

Science Evaluation

Pyraclostrobin

1.0 The Active Ingredient, Its Properties and Uses

1.1 Identity of the Active Ingredient

Active substance		Pyraclostrobin
Function		Fungicide
Chemical name		
1.	**International Union of Pure and Applied Chemistry (IUPAC)**	methyl *N*-{2-[1-(*4*-chlorophenyl)-1H- pyrazol-3-yloxymethyl]phenyl}(*N*-methoxy)carbamate
2.	**Chemical Abstracts Service (CAS)**	methyl [2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl]methoxycarbamate
CAS number		175013-18-0
Molecular formula		$C_{19}H_{18}ClN_3O_4$
Molecular weight		387.82
Structural formula		
Purity of the active ingredient		98.0% nominal (limits 95.0%–100.0%)

1.2 Physical and Chemical Properties of the Active Ingredient and End-Use Products

Technical Product—Pyraclostrobin Technical Fungicide

Property	Result
Colour and physical state	Dark brown, solid
Odour	Moderate aromatic odour
Melting range	63.7–65.2°C
Boiling point or range	Not applicable
Density	1.285 g/cm^3
Vapour pressure	Vapour pressure: 2.6×10^{-10} hPa at 20°C; 6.4×10^{-10} hPa at 25°C
Henry's law constant at 20°C	1/H 5.821×10^{8} K 4.3×10^{-11} atm m^3/mol
Ultraviolet (UV)-visible spectrum	λ_{max} = 275 nm
Solubility in water at 20°C	Deionized water: 2.41 mg/L Buffer system pH 7: 1.9 Buffer system pH 4: 2.3 Buffer system pH 9: 1.9
Solubility in organic solvents at 20°C	acetone: ≥160 g/100 mL methanol: 11 2-propanol: 3.1 ethyl acetate: ≥160 acetonitrile: ≥76 dichloromethane: ≥110 toluene: ≥100 n-heptane: 0.36 1-octanol: 2.4 olive oil: 2.9 DMF: ≥62
n-Octanol–water partition coefficient (K_{ow})	pH 6.5: log K_{ow} 4.18, K_{ow} 15136 pH 6.2: log K_{ow} 3.80, K_{ow} 6310
Dissociation constant (pKa)	Product does not contain a dissociable moiety

Property	Result
Stability (temperature, metal)	Stable to normal and elevated temperature (54°C), aluminum, aluminum acetate, iron filings and iron (II) acetate.

End-Use Product—Insignia EG Fungicide

Property	Result
Colour	Light brown
Odour	Not provided
Physical state	Extruded granules
Formulation type	Wettable granules
Guarantee	20.0% nominal (limits: 19.4%–20.6%)
Container material and description	High density polyethylene (HDPE) and nylon bags 1–10 kg
Density	0.574 kg/L
pH of 1% dispersion in water	6.98
Oxidizing or reducing action	The product can be considered a mild reducing agent and it should not be mixed with or stored in close proximity to strong oxidizing agents. It does not react with water or iron.
Storage stability	The product is stable when stored for three months and for 12 months at 5°C and warehouse temperature in commercial packaging.
Explodability	This formulation is not designed for use around electrical equipment.

End-Use Products—Headline EC Fungicide and Cabrio EG Fungicide

Details of the physical and chemical properties, the directions for use and the mode of action of Headline EC Fungicide and Cabrio EG Fungicide are summarized in REG2003-06.

1.3 Directions for Use for Insignia EG Fungicide

Insignia EG Fungicide controls turfgrass diseases. It can be applied as a foliar spray when conditions are favourable for disease development. A maximum of six applications can be made per season with no more than three consecutive applications for all diseases except pythium blight and leaf spot, where only two consecutive applications can be made before alternation with a non-strobilurin fungicide. Follow the label directions closely as rates vary for each disease.

1.4 Mode of Action for Insignia EG Fungicide

Insignia EG Fungicide is a protectant fungicide with limited translaminar systemic activity. The active ingredient, pyraclostrobin, inhibits electron transport in the mitochondria. The fungicide remains on the leaf and inhibits spore germination, growth of germ tubes and mycelia on the leaf surface. As with all strobilurin fungicides, Insignia EG Fungicide has a single site mode of action, and resistance management practices are essential to ensure its long-term usefulness.

2.0 Methods of Analysis

2.1 Methods for Analysis of the Technical Grade of Active Ingredient

The methods provided for the analysis of the active ingredient and the impurities in Pyraclostrobin Technical Fungicide have been validated and assessed to be acceptable for the determinations.

2.2 Method for Formulation Analysis

The method provided for the analysis of the active ingredient in the formulation has been validated and assessed to be acceptable for use as an enforcement analytical method.

2.3 Methods for Residue Analysis

High-performance liquid chromatography methods with tandem mass spectrometry (HPLC-MS/MS) were developed and proposed for data gathering and enforcement purposes. These methods fulfilled the requirements with regards to specificity, accuracy and precision. Acceptable recoveries (70–120%) were obtained in plant and animal matrices. Adequate extraction efficiencies were demonstrated using radiolabelled wheat (forage, grain and straw), grape, potato tuber and goat (milk, liver and muscle) samples analyzed with the enforcement method.

3.0 Impact on Human and Animal Health

3.1 Toxicology Summary

Following the original review of pyraclostrobin and the publication of REG2003-06, the applicant provided further information concerning the outstanding toxicology deficiencies. This information was examined by both the USEPA and the PMRA. A joint decision was made that the new information addressed several of the outstanding deficiencies. The new requirements were a long-term mouse study in females at higher doses than previously tested and a 28-day inhalation study in rats. The dosing levels in the mouse study were found to be too high and the test was halted following consultation with both the EPA and the PMRA. This effectively reduced the outstanding data to the subchronic inhalation study, which was submitted with the current conversion application.

A detailed review of the toxicology database available for pyraclostrobin has been completed. Data requirements identified as conditions of registration have been addressed and the toxicology database for pyraclostrobin has been updated in light of these data.

Pyraclostrobin was rapidly, but incompletely, absorbed and rapidly excreted by the rat following oral administration. Pyraclostrobin was distributed to most tissues, but the radioactivity was <1 ppm in each tissue after 120 hours. The primary route of excretion was via the feces, accounting for 79% to 92% of the administered dose (AD). Urine and biliary excretion accounted for 11% to 16% and 45% to 50% of the AD, respectively. Pyraclostrobin was extensively metabolized, resulting in the isolation of a number of metabolites from the urine and feces. The major metabolic pathways were N-demethylation and hydroxylation of the parent or glucuronide conjugates of a variety of phase I-type metabolites.

Acute dosing revealed that technical pyraclostrobin was of low toxicity by the oral and dermal routes, and was moderately toxic via the inhalation route. It was moderately irritating to the skin, minimally irritating when instilled into the eyes and was not a skin sensitizer (Maximization test). The Headline EC Fungicide formulation was of high toxicity by the oral route, and of low toxicity by the dermal and inhalation routes. It was severely irritating to the skin and moderately irritating to the eyes but was not a dermal sensitizer (Buehler method). The Cabrio EG Fungicide and Insignia EG Fungicide formulations were of low toxicity by the oral, dermal and inhalation routes. They were slightly irritating to the skin, minimally irritating when instilled into the eyes and were not a skin sensitizer (Buehler method).

Short-term repeated dermal (28-day) dosing in rats with technical pyraclostrobin did not result in any treatment-related systemic effects up to and including the highest dose level tested of 250 mg/kg body weight/day (bw/d). However, local dermal irritation was observed at dose levels of 100 mg/kg bw/d and higher.

Short-term repeated inhalation (exposure Monday through Friday for four weeks) dosing in rats with technical pyraclostrobin resulted in several mortalities at the high dose of 300 mg/m^3. Mucosal hyperplasia of the duodenum as well as atrophy/necrosis of the nasal cavities were seen in mid- (30 mg/m^3) and high-dose groups of both sexes.

The target organ for all species tested, after short-term exposure to technical pyraclostrobin, was the duodenum. In mice, thickening of the mucosa of the duodenum was observed at doses greater than or equal to 30.4/40.4 mg/kg bw/d, duodenal hyperplasia was seen in the rat at doses ≥9.0/9.6 mg/kg bw/d and mucosal hypertrophy of the duodenum was seen in dogs at the high dose of 12.9/13.6 mg/kg bw/d. In mice, ulcers/erosions of the glandular stomach were observed at doses ≥30.4/12.9 mg/kg bw/d after short-term exposure, but were not seen after long-term exposure at doses up to and including the high dose of 17.2/32.8 mg/kg bw/d. In rats, acanthosis and ulceration of the forestomach and erosions/ulcers of the glandular stomach were observed in males after long-term exposure only, at the high dose of 9.2 mg/kg bw/d. However, all but the incidence of ulceration of the glandular stomach fell within the historical control range of values and so the toxicological significance of these findings is uncertain. Other findings after short-term exposure for mice were thymus atrophy and apoptosis of the lymph nodes at doses ≥30.4/40.4 mg/kg bw/d; decreased WBC count at doses ≥274.4/162.9 mg/kg bw/d; clinical chemistry findings at ≥30.4/40.4 mg/kg bw/d; and decreased body weight and food intake at ≥119.4/162.0 mg/kg bw/d. For rats, additional findings included increased spleen weight and splenic extramedullary hematopoiesis at doses ≥68.8/79.7 mg/kg bw/d; sinus distension and histiocytosis of the spleen at ≥10.7/12.6 mg/kg bw/d; increased liver weight and hepatocyte hyperplasia for females at the high dose of 118.9 mg/kg bw/d; increased bilirubin at doses ≥68.8/79.7 mg/kg bw/d; and lower body weight gain at the high dose of 105.8/118.9 mg/kg bw/d. For dogs, lower body weight gain (females only) and clinical chemistry findings were seen at doses ≥0.8/11.2 mg/kg bw/d.

Adverse treatment-related effects after chronic exposure to pyraclostrobin were not observed in mice or rats up to and including the highest dose levels tested of 17.2/32.9 mg/kg bw/d, and 9.0/12.3 mg/kg bw/d, respectively. Originally, it was decided by both the PMRA and the USEPA that the maximum tolerated dose (MTD) had not been reached in the chronic studies. Following a revisit of the available data and discussions with the applicant and the USEPA, the consensus decision was that only female mice required retesting. The applicant began this study with a control group and a 106.5 mg/kg bw/d group, but by seven months, excessive toxicity was observed and the study was terminated. Body weight was decreased by 20% and body weight gain by 48%. The intended dose in the follow-up study was twice the previous high dose in females of 32.9 mg/kg bw/d. Because of the slow weight gain and early termination, the test substance intake per kilogram body weight was actually three times the previous high dose. The dosage achieved is acceptable as it reflects a typical dose range multiplication factor in chronic rodent studies.

Pyraclostrobin did not affect reproductive performance or reproductive parameters at any dose level tested. There were no toxicologically significant effects noted for parental animals. For offspring, the only treatment-related finding was slightly lower pup body weight for F_1 and F_2 pups on days 7, 14 and/or 21 days postpartum, which was not considered adverse. Increased susceptibility of pups was not demonstrated in this study.

Pyraclostrobin was not fetotoxic/teratogenic to rat fetuses at dose levels up to and including 50 mg/kg bw/d. Maternal findings were noted at doses ≥25 mg/kg bw/d, manifested as decreased body weight gain and food intake. There was no evidence for increased susceptibility of rat fetuses following in utero exposure to pyraclostrobin. Pyraclostrobin was teratogenic to rabbit

fetuses at the high dose of 20 mg/kg bw/d manifested as an increased incidence of fetal/litter skeletal malformations, specifically absent/misshapen lumbar vertebrae. Additional developmental findings were an increased incidence of resorptions and total litter loss at ≥10 mg/kg bw/d, and increased post-implantation loss and decreased litter size at 20 mg/kg bw/d. Maternal findings were noted at doses ≥0 mg/kg bw/d (decreased body weight gain and decreased gravid uterus weight). These findings indicate an increase in the qualitative susceptibility of the prenatal development of rabbit fetuses following in utero exposure to pyraclostrobin.

Pyraclostrobin showed no evidence of neurotoxicity in rats by either acute or subchronic exposure up to and including the highest dose levels tested of 1000 mg/kg bw/d in the acute study and 49.9/111.9 mg/kg bw/d in the subchronic study.

3.2 Determination of Acceptable Daily Intake

The previous risk assessment (REG2003-06) utilized a margin of exposure (MOE) approach in the absence of an MTD in several of the available studies. Previously, an MOE of 3000× (10× for interspecies variation, 10× for intraspecies variation, 10× for data deficiencies and 3× for the increase in the qualitative susceptibility of the rabbit fetuses) was placed on the NOAEL (no observed adverse effect level) for duodenal hyperplasia in a 28-day rat study (9.0/9.6 mg/kg bw/d for males/females). The submitted data satisfy all outstanding toxicological deficiencies and eliminate the need for the associated 10× uncertainty factor. The most appropriate study for the ADI (acceptable daily intake) is the rabbit teratology study. The dose and endpoint selected for risk assessment is 5 mg/kg bw/d (increased resorptions/litter and increased total resorptions, i.e. dams with complete litter loss, at 10 mg/kg bw/d). The dams also exhibited toxicity at 10 mg/kg bw/d, but the effects were relatively less severe (decreased body weight and food consumption, blood in the bedding, and reduced fecal output). The standard uncertainty factor of 100× has been applied to account for interspecies and intraspecies variability. A threefold factor has been retained to address the sensitivity to the young observed in the rabbit developmental study.

$$\text{ADI} = \frac{\text{NOAEL}}{\text{SF}} = \frac{5.0\ \text{mg/kg bw/d}}{300} = 0.017\ \text{mg/kg bw/d}$$

3.3 Occupational and Residential Risk Assessment

3.3.1 Toxicological Endpoints

The exposure scenario for mixers, loaders, applicators and re-entry workers is intermittent short-term to intermittent intermediate-term in duration, via the dermal and inhalation routes.

Although a 28-day repeat dose dermal study is available, it is not considered adequate for the occupational and bystander risk assessment. No effects were observed up to the highest dose tested of 250 mg/kg bw/d, which is well below the limit dose of 1000 mg/kg bw/d. It is therefore unknown whether there are systemic effects at higher doses. Because of the developmental

toxicity seen in rabbits (which is not assessed in the 28-day dermal toxicity study), it is recommended that the rabbit developmental study be used for the occupational risk assessment.

The dose and endpoint selected for dermal risk assessment is 5 mg/kg bw/d (increased resorptions/litter and increased total resorptions, i.e. dams with complete litter loss, at 10 mg/kg bw/d). The dams also exhibited toxicity at 10 mg/kg bw/d, but the effects were relatively less severe (decreased body weight and food consumption, blood in the bedding, and reduced fecal output). The standard uncertainty factor of 100× has been applied to account for interspecies and intraspecies variability. A threefold factor has been retained to address the sensitivity to the young observed in the rabbit developmental study. Therefore, the target margin of exposure (MOE) is 300.

A repeat dose (20-day) inhalation study had a LOAEL (lowest observed adverse effect level) of 30 mg/m^3 due to mucosal hyperplasia of the duodenum as well as atrophy/necrosis of the nasal cavities. The NOAEL was 1 mg/m^3, which translates to 0.23 mg/kg bw/day. The standard uncertainty factor of 100× has been applied to account for interspecies and intraspecies variability. A threefold factor has been retained to address the sensitivity to the young observed in the rabbit developmental study. Therefore, the target MOE is 300.

Dermal Absorption
Male Charles River rats were dermally administered nominal doses of 0.01 (aqueous spray dilution) and 2.50 mg/cm^2 (undiluted formulation) of pyraclostrobin in a liquid formulation for 10 hours and monitored up to 168 hr post-dosing. Total amounts of recovery of radioactivity in samples, as a percentage of the total dose, ranged from 96.48% to 110.22%. Dermal absorption was considerably higher at the lowest dose administered, 23% and 21% (at 10-hour and 168-hour sacrifice, respectively) compared to the higher dose group, 5% and 4% (at 10-hour sacrifice and 168-hour sacrifice, respectively). The amount of pyraclostrobin in the treated skin decreased over time for both doses indicating that the skin-bound residues become bioavailable. Therefore, these residues are included in the total dermal absorption. Given the uncertainty regarding actual deposition under actual field conditions, it is considered appropriate to derive an estimate of dermal absorption based on the results from the low dose group (0.01 mg/cm^2 skin), as the percent dermal absorption was greatest at this dose level. Based on the likely worker exposure time frame, it is considered appropriate to adopt the dermal absorption value calculated for the group of animals that was sacrificed after 10 hours and for which the skin site was washed. Mean dermal absorption for this group of animals was 23%. This value is considered appropriate for use in an occupational exposure risk assessment.

Insignia EG Fungicide:

3.3.2 Occupational Exposure and Risk

3.3.2.1 Handler Exposure and Risk

Exposure estimates for golf course workers handling Insignia EG Fungicide are based on PHED or ORETF unit exposure values, a maximum application rate of 0.560 kg a.i./ha, and default area treated/day values of 16 ha/day for groundboom, 2 ha/day for low pressure turf gun, or

0.4 ha/day for backpack sprayers. The MOEs for mixers/loaders and applicators are above the target of 300 for dermal and inhalation exposure with the protective equipment specified on the label.

3.3.2.2 Postapplication Exposure and Risk

Dermal exposure would be the predominant route of exposure for workers and golfers (adults and youths) re-entering treated golf course turf. Based on the turf transferable residue (TTR) study submitted in support of this submission, a TTR value of 0.67% of the application rate is considered appropriate to estimate re-entry exposure. The MOEs for golf course workers re-entering treated turf for maintenance activities are above the target of 300.

3.3.3 Residential Exposure and Risk

3.3.3.1 Handler Exposure and Risk

There are no domestic class products; therefore, a residential handler assessment was not required.

3.3.3.2 Postapplication Exposure and Risk

The MOEs for adults and youths exposed to pyraclostrobin residues on turf as a consequence of golfing are above the target of 300 for dermal exposure.

3.3.4 Bystander Exposure and Risk Assessment

For bystanders, exposure is expected to be negligible, based on label directions intended to minimize spray drift.

Headline EC Fungicide and Cabrio EG Fungicide:

3.3.2 Occupational Exposure and Risk

The data requirement to convert Cabrio EG Fungicide from conditional to full registration, was a new in vivo dermal absorption study conducted in rats with Cabrio EG Fungicide. In response an in vivo dermal absorption study conducted in rats with Headline EC Fungicide was submitted. This study was considered acceptable to satisfy the outstanding exposure data requirement of Cabrio EG Fungicide as the study was conducted with a liquid formulation of pyraclostrobin, which would result in the conservative dermal absorption, exposure and risk estimates. The inhalation toxicological endpoint was reassessed based on the review of a new inhalation toxicity study. As a result of the review of these two studies, the dermal and inhalation exposure and risk estimates for all uses currently on the label for Cabrio EG Fungicide were updated based on a new dermal absorption value of 23% and an inhalation NOAEL of 0.23 mg/kg bw/day.

Although no data requirements were identified to convert Headline EC Fungicide from conditional to full registration, the dermal and inhalation exposure and risk estimates for workers for all uses currently on the label for Headline EC Fungicide were updated based on the new dermal absorption value of 23% and an inhalation NOAEL of 0.23 mg/kg bw/day. In addition, the personal protective equipment on the labels was updated.

3.3.2.1 Mixer, Loader and Applicator Exposure and Risk Assessment

The occupational exposure of mixers, loaders and applicators to pyraclostrobin were reassessed using the unit generic exposure estimates from the Pesticide Handlers' Exposure Database (PHED Version 1.1).

The updated dermal and inhalation exposure estimates and margins of exposure derived for mixers/loaders and applicators of Headline EC and Cabrio EG Fungicide are presented in Appendix I, Tables 3 to 6. These margins of exposure for dermal and inhalation routes are acceptable. Thus, for Headline EC Fungicide, the current uses on the label are acceptable with an additional requirement that mixers/loaders wear a respirator. For Cabrio EG Fungicide, for all crops currently listed on the label with the exception of root vegetables, the exposure and risk estimates for mixers/loaders and applicators are acceptable with personal protective equipment as currently stated on the label. For root vegetables, custom mixing, loading and application to more than 100 ha requires a closed mixing, loading and application system.

3.3.2.2 Postapplication Exposure and Risk

There is potential for intermittent intermediate-term exposure to workers handling Headline EC Fungicide and Cabrio EG Fungicide treated crops throughout the season. The postapplication exposure and risk estimates for Headline and Cabrio Fungicide were reassessed based on the new dermal absorption of 23%. The MOEs for current uses on the labels for Headline EC Fungicide and Cabrio EG Fungicide are considered acceptable with changes in the restricted-entry intervals (REI). The new REI statements, as stated on each end-use product label, are presented in Appendix I, Tables 7 and 8. For dry field beans and peas on the Headline EC Fungicide label, there is no need to specify the new hand harvesting REI of 24 hours as the 30-day preharvest interval (PHI) for these crops is considerably longer than the REI. Similarly for stone fruits on the Cabrio EG Fungicide label, there is no need to specify the new REI of 24 hours for harvesting stone fruits as the PHI for stone fruits is 10 days. For all crops, for both end-use products, if the risk-based REI was not required, a default REI of 12 hours was recommended. For grapes, based on the new assessment, the REI was reduced from 29 to 28 days. However, this REI is still not considered feasible.

3.3.3 Residential Exposure and Risk

As no residential uses are proposed, a residential exposure and risk assessment was not required.

3.3.4 Bystander Exposure and Risk Assessment

For bystanders, exposure is expected to be negligible, based on label directions intended to minimize spray drift.

3.4 Food Residues Exposure Assessment

Please refer to REG2003-06, *Pyraclostrobin, Headline EC, Cabrio EG*, for a detailed assessment of the residue chemistry database for pyraclostrobin and the two end-use products. The following revisions are intended to replace the text for Sections 2.3, 3.5 and 7.0 in REG2003-06.

The revisions to the analytical methodology data, field trial data, and the acute and chronic dietary risk estimates are summarized in Appendix I, Tables 1, 9 and 10.

3.4.1 Residues in Plant and Animal Foodstuffs

The residue definition for risk assessment and enforcement in plant products is pyraclostrobin and the desmethoxy metabolite BF 500-3, and in animal commodities is pyraclostrobin and the metabolites convertible to BF 500-5 for ruminant matrices and BF 500-5 and BF 500-9 for poultry matrices. The liquid chromatography with tandem mass spectrometry (LC-MS/MS) data-gathering and enforcement analytical methodologies are valid for the quantification of these residues in plant and animal matrices. The residues of pyraclostrobin and the metabolite BF 500-3 are stable when stored at <-10 °C for 750 days in grape juice, tomato, sugar beet (tops and roots) and wheat (grain and straw) and for 570 days in peanut (nutmeat and oil). In ruminant matrices, the residues of pyraclostrobin are stable in cow muscle, liver and milk when stored frozen at -20°C for 240 days (~8 months), and residues of BF 500-10 are stable under these conditions in cow muscle and liver for 240 days and in milk for 120 days. In eggs, the storage stability data indicated that residues of pyraclostrobin and the metabolite BF 500-16 are stable under frozen storage conditions (<-10°C) for up to seven months. Raw agricultural commodities were processed, and a slight concentration of residues of pyraclostrobin and the desmethoxy metabolite BF 500-3 was observed in citrus oil, raisins, peanut oil, prunes and tomato paste. No concentration was observed in any other processed fractions. Supervised residue trials conducted throughout the United States and Canada using end-use products containing pyraclostrobin in or on the following crops are sufficient to support the maximum residue limits: banana, berries, bulb vegetables (Crop Group 3), cereals (barley, rye and wheat), cucurbit vegetables (Crop Group 9), fruiting vegetables (Crop Group 8), peanuts, potatoes, pulses (Crop Subgroup 6C), root vegetables (Crop Subgroup 1B), stone fruits (Crop Group 12), strawberries and sugar beets.

3.4.2 Dietary Risk Assessment

Acute and chronic dietary risk assessments were conducted using the Dietary Exposure Evaluation Model (DEEM–FCID™, Version 2.0), which uses updated food consumption data from the United States Department of Agriculture's Continuing Surveys of Food Intakes by Individuals, 1994–1996 and 1998.

3.4.2.1 Chronic Dietary Exposure Results and Characterization

The following assumptions were made in the refined chronic analysis: residues in crops based on Canadian and U.S. Supervised Trial Median Residues (STMRs), experimental and default processing factors, percent crop treated information and anticipated residues in animal matrices. The refined chronic dietary exposure from all supported pyraclostrobin food uses (only) for the total population is 16.3% of the ADI. Aggregate exposure from food and water is considered acceptable. The PMRA estimates that chronic dietary exposure for the total population to pyraclostrobin from food and water is 16.5% of the ADI. The highest exposure and risk estimate is for children 1–2 years old at 31.6% of the ADI.

3.4.2.2 Acute Dietary Exposure Results and Characterization

The following assumptions were made in the refined acute analysis: residues in crops based on Canadian and U.S. STMRs for blended commodities, Highest Average Field Trial (HAFT) or highest residues for nonblended and partially blended commodities, experimental and default processing factors, percent import information and anticipated residues for animal matrices. The refined acute dietary exposure (food only) for all supported pyraclostrobin registered commodities is estimated to be 91.6% of the ARfD (acute reference dose) for females 13–49 years old (95th percentile, deterministic), and therefore does not exceed the PMRA's level of concern. Aggregate exposure from food and water is considered acceptable at 92.8% of the ARfD for females 13–49 years old.

3.4.3 Aggregate Exposure and Risk

The aggregate risk for pyraclostrobin consists of exposure from food and drinking water sources only; there are no residential uses. Aggregate risks were calculated based on acute (females 13–49 years old) and chronic endpoints. There was no acute endpoint identified for the general population, including infants and children.

3.4.4 Maximum Residue Limits

Table 3.4.4 Proposed Maximum Residue Limits (MRLs)

MRLs (ppm)	Foods
3.5	Berries (Crop Group 13)
0.9	Bulb vegetables (Crop Group 3)
0.1	Meat and meat byproducts of poultry, eggs

For additional information on MRLs in terms of the international situation and trade implications, refer to Appendix II.

4.0 Impact on the Environment

Refer to REG2003-06, *Pyraclostrobin, Headline EC, Cabrio EG,* for a detailed assessment of the environmental impact of pyraclostrobin and its end-use products (Headline EC Fungicide, Cabrio EG Fungicide).

4.1 Fate and Behaviour in the Environment

A waiver request was submitted for the biotransformation of pyraclostrobin in aerobic water-sediment systems, which recommended that the PMRA conduct the drinking water risk assessment using zero degradation in the water as this would represent the worse case scenario. In the drinking water risk assessment conducted using zero degradation in the water, no risk was identified. Although the briotransformation study is not required at this time, the necessity of this study will be revisited if any risk is identified in the future.

4.2 Effects on Non-Target Species

An acute toxicity of BF 500-3 to freshwater invertebrates study, an acute toxicity of BF 500-3 to freshwater fish study, an acute toxicity of BF-500-3 to freshwater green algae study and a toxicity of pyraclostrobin to non-target terrestrial plant study were submitted to address data gaps identified in REG2003-06.

4.2.1 Effects on Terrestrial Organisms

For non-target terrestrial plants, detrimental effects were less than 25% for the seedling emergence and vegetative vigour in four monocot and six dicot plant species at 560 g a.i./ha. The single maximum application rate and maximum seasonal cumulative application rate on the current Headline EC Fungicide label are 225 g a.i./ha and 1000 g a.i./ha. Therefore, pyraclostrobin will pose only a moderate risk to non-target terrestrial plants when Headline EC Fungicide is applied at the highest label rate.

The maximum single application rate and maximum seasonal cumulative application rate on the current Cabrio EG Fungicide label are 224 and 1200 g a.i./ha. Hence, pyraclostrobin is expected to pose a moderate risk to terrestrial vascular plants when Cabrio EG Fungicide is applied at the highest label rate.

The maximum single application rate and maximum seasonal cumulative application rate on the current Insignia EG Fungicide label are 560 and 2828 g a.i./ha. Hence, pyraclostrobin is expected to pose a moderate risk to terrestrial vascular plants when Insignia EG Fungicide is applied at the highest label rate.

4.2.2 Effects on Aquatic Organisms

The risk posed by the major transformation product, BF 500-3, to aquatic organisms was based upon evaluation of toxicity data for three freshwater species: *Daphnia magna*, rainbow trout (*Oncorhynchus mykiss*), and green algae (*Pseudokirchneriella subcapitata*, previously named

Selenaastrum capricornutum). Due to the low solubility of BF 500-3, the highest concentrations tested in the acute *Daphnia magna* and rainbow trout toxicity studies were 92 µg BF 500-3/L and 94.8 µg BF 500-3/L, respectively. No mortality or sublethal effects were observed at these concentrations. The 48-hour NOEC (no observed effect concentration) for *Daphnia magna* and 96-hour NOEC for rainbow trout were 92 µg BF 500-3/L and 94.8 µg BF 500-3/L, respectively.

In a 96-hour acute static test, the freshwater green algae (*Pseudokirchneriella subcapitata*) was exposed to BF 500-3 at initial mean measured concentrations of 0, 28.6, 60.6, 186, 347 and 974 µg BF 500-3/L. The 96-hour NOEC and EC_{50} based on cell density, growth rate and biomass were 28.6 and >974 µg BF 500-3/L, respectively (Appendix I, Table 11).

4.3 Screening Level Risk Assessment of Insignia EG Fungicide on Non-Target Species

When Insignia EG Fungicide is applied at the maximum proposed application rate (560 g a.i./L), pyraclostrobin is not expected to pose a significant risk to blue green algae (*Anabaena flosaquae*), earthworm, bobwhite quail or mallard duck. Small wild mammals may be at high risk through dietary exposure as the risk quotients (RQs) for rat and mouse based on acute dietary endpoints are greater than one (Appendix I, Table 12). Pyraclostrobin is expected to pose a moderate risk to terrestrial vascular plants and green algae (*Pseudokirchneriella subcapitata)*, a high risk to *Daphnia magna*, mollusk, sheepshead minnow, and marine algae (*Skeletonema costatum*), a very high risk to diatom, rainbow trout, bluegill sunfish, mysid and fathead minnow, and an extremely high risk to amphibians. Therefore, buffer zones of 1 to 20 metres for ground application are required to protect nearby freshwater, estuarine/marine and terrestrial habitats from the effects of spray drift.

5.0 Value

Insignia EG Fungicide

5.1 Effectiveness Against Pests

5.1.1 Acceptable Efficacy Claims

A total of 72 trials were submitted to support label claims, demonstrate equivalence between formulations (bridging trials) and support the statement of non-phytotoxicity on turf. Trials were conducted between 1996 and 2000, and were made in Canada (BC, AB, ON), the U.S. (CA, GA, IN, KY, MD, MI, MS, MO, NJ, NC, OH, PA, SC and VA) and Germany, with the vast majority of trials conducted in the U.S. on golf course turf. There were 66 trials testing Insignia EG Fungicide on a preventative schedule, and six on a curative basis (after disease had been established). The majority of trials testing Insignia EG Fungicide compared it to other commercial fungicides, especially Heritage (azoxystrobin). Multiple turfgrass varieties were tested in the studies, including tall fescue, perennial ryegrass, Kentucky bluegrass, bentgrass, annual bentgrass, colonial bentgrass, creeping bentgrass and white bentgrass.

When compared to the untreated turf plots, Insignia EG Fungicide was shown to be an effective fungicide, as it showed acceptable levels of fungal disease control and no phytotoxic symptoms

on turfgrass were reported. Data demonstrated that rates slightly lower than those proposed were proven to be effective in controlling disease levels for some of the label claims. The rates proposed on the Insignia EG Fungicide label ranged between 308 and 560 g a.i./ha, applied at intervals of 14, 21 or 28 days. Data supported application rates of between 280 and 560 g a.i./ha, with either single applications or multiple applications at 14- to 28-day intervals. Specific diseases, rates and application intervals that were supported are summarized in Table 5.1 below.

Results demonstrate that Insignia EG Fungicide was effective in controlling the following diseases: brown patch (*Rhizoctonia solani*), gray leaf spot *(Pyricularia grisea)*, gray snow mould *(Typhula incarnata, T. ishikariensis),* leaf spot (*Dreschslera spp* and *Bipolaris spp*), pink snow mould (*Microdochium nivale)*, pythium blight *(Pythium aphanidermatum)*, and rust *(Puccinia spp.)*

Table 5.1 Turfgrass Disease Claims Supported for Insignia EG Fungicide

Disease (Pathogen)	Use Rate (g/1000 m^2)	Use Rate (g/ha)	Application Interval (days)	Comments
Brown patch (*Rhizoctonia solani, R. zeae)*	140–250	1400–2500	14–21	Apply when conditions are favourable for disease development.
Gray leaf spot (*Pyricularia grisea*)	140	1400	14	Apply preventative applications and continue applications while conditions are favourable for disease development.
	280	2800	28	
Gray snow mould/ Typhula Blight (*Typhula spp.*)	170	1700	single application	Make a single application of 170 g or two applications of 85 g, 14–28 days apart in the late fall just prior to snow cover.
	85	850	14-28	
Leaf spot (*Dreschslera spp. Bipolaris spp.*)	154	1540	14	Apply when conditions are favourable for disease development.
Pink snow mould (*Microdochium nivale)*	250	2500	single application	Make a single application in the late fall just prior to snow cover. For optimum control under severe disease pressure, tank mix with another snow mould fungicide (non-strobilurin).
Pythium blight (*Pythium aphanidermatum*)	225	2250	14	Begin preventative application when conditions are favourable for disease development. Tank mix with another pythium fungicide (non-strobilurin), during severe disease pressure or when symptoms are already present.

Disease (Pathogen)	Use Rate (g/1000 m^2)	Use Rate (g/ha)	Application Interval (days)	Comments
Rust (*Puccinia spp.*)	125	1250	14	Apply when conditions are favourable for disease development.

5.2 Phytoxicity to Host Plants

No phytotoxicity was reported in any of the turfgrass trials.

5.3 Impact on Succeeding Crops

No data were provided on this aspect.

5.4 Economics

No data were provided on this aspect.

5.5 Sustainability

5.5.1 Survey of Alternatives

Crop	Active Ingredient
Turfgrass	Quintozene, thiophanate-methyl, captan, iprodione, chlorothalonil, propiconazole, azoxystrobin, myclobutanil, trifloxystrobin, triticonazole, chloroneb, etridiazole, fludioxonil, metalaxyl, fosetyl-Al.

Pyraclostrobin, the active ingredient in Insignia EG Fungicide, is the third registered fungicide from the strobilurin chemical class for use on turf. The addition of Insignia EG Fungicide use on turf will provide growers with a choice of strobilurin fungicides for this use.

5.5.2 Compatibility with Current Management Practices Including Integrated Pest Management

This product should complement current management practices based on broad-spectrum disease control.

5.5.3 Information on the Occurrence or Possible Occurrence of the Development of Resistance

Pyraclostrobin is one of several strobilurin (Group 11) fungicides on the market and is effective against pathogens resistant to fungicides with modes of action different from those of strobilurin fungicides (Target site Group 11). However, acquired resistance to Group 11 fungicides may

develop if these fungicides are used predominantly and repeatedly. As a result, consecutive applications are restricted and alternation with fungicides of different modes of action are necessary. The resistance management recommendations on the label adequately address these concerns.

5.5.4 Contribution to Risk Reduction and Sustainability

The broad spectrum of activity will add to current turf disease management practices.

Headline EC Fungicide and Cabrio EG Fungicide

Aerial Application
Efficacy data, based on Headline EG Fungicide being applied in low water volume (25 to 50 L/ha) by ground application equipment to simulate aerial application, were submitted on various crops to support the claim for aerial application. The same level of disease control was found between the low water volume treatments and the regular ground application water volume (100 L/ha) with respect to levels of disease control. Based on this limited data set, it is believed that there should be no unacceptable loss of efficacy on other labelled crops when Headline EG Fungicide is applied by air. Therefore, aerial application of Headline EC Fungicide is supported for all crops on the label, with the exception of sugar beets. Since the upper rate range for sugar beets is higher than the rest of the label (0.9 L/ha vs 0.67 L/ha), buffer zones will be affected if applied by air, and therefore sugar beets will not be supported for aerial application at this time.

The request for aerial application on all crops on the Cabrio EG Fungicide label was withdrawn; therefore, this application method is not supported for this product at this time.

6.0 Toxic Substances Management Policy Considerations

During the original review of pyraclostrobin, the PMRA had taken into account the federal Toxic Substances Management Policy (TSMP) and its Regulatory Directive, DIR99-03. It was determined that pyraclostrobin did not meet the TSMP Track 1 criteria.

The end-use product Insignia EG Fungicide does not contain any formulants of health or environmental concern identified in the *Canada Gazette*, Part II, Volume 139, Number 24, pages 2641-2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern.*

Therefore, the use of Insignia EG Fungicide is not expected to result in the entry of Track 1 substances into the environment.

7.0 Summary

7.1 Human Health and Safety

The toxicology database submitted for pyraclostrobin is adequate to define the majority of toxic effects that may result from human exposure. In subchronic and chronic studies on laboratory animals, the primary targets were the GI tract, liver and spleen. There was no evidence of carcinogenicity in rats or mice after longer-term dosing. There was some evidence of increased susceptibility of the young in developmental toxicity studies. Pyraclostrobin is not considered to be a neurotoxicant.

Mixers, loaders, applicators and workers entering treated areas are not expected to be exposed to levels of pyraclostrobin that will result in unacceptable risk when Headline EC Fungicide, Cabrio EG Fungicide and Insignia EG Fungicide are used according to label directions.

The nature of the residue in potato, grape and wheat plants and animals is adequately understood. The residue definition in plant products is pyraclostrobin and the desmethoxy metabolite, BF 500-3 ([2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl] carbamate) and in animal commodities is pyraclostrobin and the metabolites convertible to BF 500-5 (1-(4-chlorophenyl)-1*H*-pyrazol-3-ol) and BF 500-8 (1-(4-chloro-2-hydroxy phenyl)-1*H*-pyrazol-3-ol) for ruminant matrices and BF 500-5 and BF 500-9 (1-(3-chloro-4-hydroxyphenyl)-1*H*-pyrazol-3-ol) for poultry matrices. The use of pyraclostrobin on root vegetables (except sugar beet), bulb vegetables, dried shelled pea and bean (except soybean), fruiting vegetables (except cucurbits), cucurbit vegetables, citrus fruits, stone fruits, berries, tree nuts, barley, rye, wheat, banana, grapes, sugar beet, peanut and strawberry does not constitute an unacceptable chronic or acute dietary risk (food and drinking water) to any segment of the population, including infants, children, adults and seniors. Sufficient crop residue data have been reviewed to recommend maximum residue limits to protect human health. The PMRA recommends that the following maximum residue limits be specified under the authority of the *Pest Control Products Act*.

Residues of pyraclostrobin and the desmethoxy metabolite BF 500-3 will be covered by the following MRLs:

Crop Group 13 - berries (previously proposed at 1 ppm as per PMRL2006-01)	3.5 ppm
Crop Group 3 - bulb vegetables (previously proposed at 0.65 ppm as per PMRL2006-01)	0.9 ppm

Residues of pyraclostrobin and metabolites convertible to BF 500-5 and BF 500-9 will be covered by the following MRLs:

Meat and meat byproducts of poultry	0.1 ppm
Eggs	0.1 ppm

7.2 Environmental Risk

A detailed assessment of the environmental impact of pyraclostrobin and its end-use products, Headline EC Fungicide and Cabrio EG Fungicide, is provided in REG2003-06.

The data submitted to address the deficiencies identified in REG2003-06 indicate that BF 500-3 is a major transformation product in soil but not a major transformation product in aquatic systems. The concentrations of BF 500-3 in aquatic systems is not expected to be significant or pose any environmental risk to *Daphnia magna*, rainbow trout (*Oncorhynchus mykiss*) or green algae (*Pseudokirchneriella subcapitata*).

When used according to label directions, Insignia EG Fungicide is not expected to pose a significant risk to blue green algae (*Anabaena flosaquae*), earthworm, bobwhite quail or mallard duck. Small wild mammals may be at high risk through dietary exposure. It is expected to pose a moderate risk to terrestrial vascular plants and green algae (*Pseudokirchneriella subcapitata)*, a high risk to *Daphnia magna*, mollusk, sheepshead minnow, and marine algae (*Skeletonema costatum*), a very high risk to diatom, rainbow trout, bluegill sunfish, mysid and fathead minnow, and an extremely high risk to amphibians. Therefore, buffer zones of 1 to 20 metres for ground application are required to protect nearby freshwater, estuarine/marine and terrestrial habitats from the effects of spray drift.

7.3 Value

Aerial application of Headline EC Fungicide is fully supported for all labelled crops, with the exception of sugar beets.

Insignia EG Fungicide was shown to be an effective fungicide, as it showed acceptable levels of fungal disease control and no phytotoxic symptoms on turfgrass were reported. The use of Insignia EG Fungicide on turf will provide growers with a choice of strobilurin fungicides for this use.

8.0 Proposed Regulatory Decision

Health Canada's PMRA, under the authority of the *Pest Control Products Act*, is proposing full registration for the sale and use of the technical grade active ingredient pyraclostrobin and the end-use products Insignia EG Fungicide, Headline EC Fungicide and Cabrio EG Fungicide. An evaluation of current scientific data from the applicant and scientific reports has resulted in the determination that, under the proposed conditions of use, the end-use products have value and do not present an unacceptable risk to human health or the environment.

List of Abbreviations

µg	microgram(s)
a.i.	active ingredient
AD	administered dose
ADI	acceptable daily intake
ALS	acetolactate synthase
ARfD	acute reference dose
atm	atmosphere
bw	body weight
CAS	Chemical Abstracts Service
cm	centimetre(s)
d	day(s)
DA	dermal absorption
dw	dry weight
EC	emulsifiable concentrate
EC_{50}	effective concentration on 50% of the population
EC_{25}	effective concentration on 25% of the population
EEC	expected environmental concentration
EG	extruded granule
g	gram(s)
GI	gastrointestinal
ha	hectare(s)
HAFT	highest average field trial
HPLC	high performance liquid chromatography
IUPAC	International Union of Pure and Applied Chemistry
kg	kilogram(s)
K_{ow}	*n*-octanol–water partition coefficient
L	litre(s)
LC-MS/MS	liquid chromatography with tandem mass spectrometry
LC_{50}	lethal concentration 50%
LD_{50}	lethal dose 50%
LOAEL	lowest observed adverse effect level
LOQ	limit of quantitation
mg	milligram(s)
mL	millilitre(s)
MOE	margin of exposure
MRL	maximum residue limit
MTD	maximum tolerated dose
N/A	not applicable
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
ORETF	Outdoor Residential Exposure Task Force
PHED	Pesticide Handlers Exposure Database
PHI	preharvest interval
pKa	dissociation constant

PMRA	Pest Management Regulatory Agency
ppm	parts per million
RD	residue definition
REI	restricted-entry interval
RQ	risk quotient
SF	safety factor
STMR	Supervised Trial Median Residue
TRR	total radioactive residue
TTR	turf transferable residues
TSMP	Toxic Substances Management Policy
USEPA	United States Environmental Protection Agency
UV	ultraviolet

Appendix I Tables and Figures

Table 1 Residue Analysis

Matrix	Method ID	Analyte	Method Type	LOQ	Reference
Animal	D9902	Pyraclostrobin and metabolites hydrolyzable to BF 500-5 and BF 500-9 in poultry matrices.	HPLC-MS/MS	0.05 ppm for each analyte	1088016
Method D9902 was validated by an independent laboratory and allowed a sensitive determination of pyraclostrobin and the metabolite BF 500-16 in hen heart/muscle at the LOQ of 0.05 ppm.					

Table 2 Toxicology Study

STUDY	SPECIES/STRAIN AND DOSES	NOAEL and LOAEL mg/kg bw/day	TARGET ORGAN/ SIGNIFICANT EFFECTS/ COMMENTS	Reference
SHORT TERM				
Inhalation	98.7%, Wistar rats, 0, 1, 30, or 300 mg/m^3 (0, 0.001, 0.03 or 0.3 mg/L) for 6 hours/day, 5 days/week for a total of 20 days, 10/sex/dose	LOAEL = 30 mg/m^3 NOAEL = 1 mg/m^3	≥30 mg/m^3 Mucosal hyperplasia of the duodenum ♂ and ♀ Atrophy/necrosis of the nasal cavities ♂ and ♀ 300 mg/m^3 Mortalities ↓ BWG ♂	1087938

BWG: body weight gain

Table 3 Mixer/Loader/Applicator Dermal Exposure and Risk for Headline EC

	Occupational Scenario	Dermal Exposure[1] (mg/kg bw/day)	Margin of Exposure (based on a NOAEL of 5 mg/kg bw/day[2])
Wheat,[3] lentil,[4] and succulent shelled beans and peas	mixer/loader + groundboom application (farmer)	0.0062	804
	mixer/loader + groundboom application (custom)	0.0092	544
	mixer/loader (for aerial application)	0.0124	405
	aerial application	0.0023	2143
Corn	mixer/loader + groundboom application (farmer)	0.0062	804
	mixer/loader + groundboom application (custom)	0.0092	544

	Occupational Scenario	Dermal Exposure[1] (mg/kg bw/day)	Margin of Exposure (based on a NOAEL of 5 mg/kg bw/day[2])
Potato[5]	mixer/loader + groundboom application (farmer)	0.0037	1346
	mixer/loader + groundboom application (custom)	0.0103	485
Sugar beet	mixer/loader + groundboom application (farmer)	0.005	1005
Grass grown for seed	mixer/loader + groundboom application (farmer)	0.007	718
	mixer/loader + groundboom application (custom)	0.0103	485
	mixer/loader (for aerial application)	0.0138	361
	aerial application	0.0026	1914
Alfalfa for seed	mixer/loader + groundboom application (farmer)	0.0041	1206
	mixer/loader + groundboom application (custom)	0.0061	816
	mixer/loader (for aerial application)	0.0082	607
	aerial application	0.0016	3215

1 Based on an open mixing and loading system with mixers/loaders wearing a single layer and gloves, groundboom and aerial applicators wearing a single layer and no gloves. For custom groundboom application, a closed cab scenario was used; for all other groundboom application scenarios (i.e. farmer), an open cab scenario was used
Daily dose = default area treated (ha/day) × application rate (kg a.i./ha) × PHED exposure (µg-a.i./kg) × conversion factor (1 mg a.i./1000 µg a.i./kg)/body weight (70 kg)

2 Based on the rabbit developmental study, target MOE = 300

3 Wheat is the representative crop for wheat, barley, rye and chickpeas.

4 Lentils are the representative crop for lentils, field peas (dry) and field beans (dry)

5 At lower application rate of 0.168 g a.i./ha

Table 4 Mixer/Loader/Applicator Inhalation Exposure and Risk for Headline EC

	Occupational Scenario	Inhalation Exposure[1] (mg/kg bw/day)	Margin of Exposure (based on a NOAEL of 0.23 mg/kg bw/day[2])
Wheat,[3] lentil,[4] and succulent shelled beans and peas	mixer/loader + groundboom application (farmer)	0.0004	639
	mixer/loader + groundboom application (custom)	0.0001	1626
	mixer/loader (for aerial application)	0.0002	1369
	aerial application	0.0001	3129

	Occupational Scenario	Inhalation Exposure[1] (mg/kg bw/day)	Margin of Exposure (based on a NOAEL of 0.23 mg/kg bw/day[2])
Corn	mixer/loader + groundboom application (farmer)	0.0004	639
	mixer/loader + groundboom application (custom)	0.0001	1626
Potato[5]	mixer/loader + groundboom application (farmer)*	0.0002	1070
	mixer/loader + groundboom application (custom)	0.0002	1452
Sugar beet	mixer/loader + groundboom application (farmer)*	0.0003	799
Grass grown for seed	mixer/loader + groundboom application (farmer)	0.0004	570
	mixer/loader + groundboom application (custom)	0.0002	1452
	mixer/loader (for aerial application)	0.0002	1222
	aerial application	0.0001	2794
Alfalfa for seed	mixer/loader + groundboom application (farmer)*	0.0002	958
	mixer/loader + groundboom application (custom)*	0.0001	2439
	mixer/loader (for aerial application)	0.0001	2054
	aerial application	0.00005	4695

1 Based on an open mixing and loading system with mixers/loaders wearing a single layer, gloves and respirator, groundboom and aerial applicators wearing a single layer and no gloves. For custom groundboom application, a closed cab scenario was used; for all other groundboom application scenarios (i.e. farmer), an open cab scenario was used. Daily dose = default area treated (ha/day) × application rate (kg a.i./ha) × PHED exposure (µg a.i./kg) × conversion factor (1 mg a.i./1000 µg a.i./kg)/body weight (70 kg)

2 Based on the 28-day inhalation study, target MOE = 300

3 Wheat is the representative crop for wheat, barley, rye and chickpeas

4 Lentil is the representative crop for lentils, field peas (dry) and field beans (dry)

5 At lower application rate of 0.168 g a.i./ha

* A respirator is not required while mixing/loading.

Table 5 Mixer/Loader/Applicator Dermal Exposure to Cabrio EG

Occupational Scenario	Exposure [1] (mg/kg bw/day)		Margin of Exposure (based on a NOAEL of 5 mg/kg bw/day[2])
Bulb vegetables (onion)[3] and cucurbit vegetables (cucumber, cantaloupe, squash)[4] - mixer/loader + groundboom application	farmer	0.0035	1439
	custom	0.0087	575
Fruiting vegetables (peppers and tomatoes)[5] - mixer/loader + groundboom application	farmer	0.0041	1208
	custom	0.0103	483
Root vegetables (carrot)[6] - mixer/loader + groundboom application	farmer	0.0116	432
	custom (up to 100 ha)	0.0145	345
	custom (>100 ha)[a]	0.0109	459
Highbush blueberries - mixer/loader + airblast application	farmer	0.0057	874
Lowbush blueberries - mixer/loader + groundboom application	farmer	0.0016	3223
Strawberries - mixer/loader + groundboom application	farmer	0.0005	9668
Grapes - mixer/loader + airblast application	farmer	0.0056	892
Stone fruits (peach)[7] - mixer/loader + airblast application	farmer	0.0096	522
Stone fruits (cherries)[7] - mixer/loader + airblast application	farmer	0.0019	2609

1 Based on individuals wearing a single layer of clothing and gloves, except for the groundboom applicators, for whom exposure was estimated based on not wearing gloves. Daily dose = default area treated (ha/day) × application rate (kg a.i./ha) × PHED exposure (µg a.i./kg) × conversion factor (1 mg a.i./1000 µg a.i./kg)/body weight (70 kg)

2 Based on a rabbit developmental study, target MOE = 300

3 Green onions are the representative crop for bulb vegetables

4 Field cucumbers are the representative crop for cucurbit vegetables

5 Field tomatoes are the representative crop for fruiting vegetables

6 Carrots are the representative crop for root vegetables

7 Peaches are the representative crop for stone fruits.

a Closed mixing, loading

Table 6 Mixer/Loader/Applicator Inhalation Exposure to Cabrio EG

Occupational Scenario	Exposure [1] (mg/kg bw/day)		Margin of Exposure (based on a NOAEL of 0.23 mg/kg bw/day[2])
Bulb vegetables (onion)[3] and cucurbit vegetables (cucumber, cantaloupe, squash)[4] - mixer/loader + groundboom application	farmer	0.0002	1513
	custom	0.0004	605
Fruiting vegetables (peppers and tomatoes)[5] - mixer/loader + groundboom application	farmer	0.0002	1271
	custom	0.0005	508
Root vegetables (carrot)[6] - mixer/loader + groundboom application	farmer	0.0005	454
	custom (100 ha)	0.0003	677
	custom[a] (>100 ha)	0.0002	1479
Highbush blueberries - mixer/loader + airblast application	farmer	0.0002	984
Lowbush blueberries - mixer/loader + groundboom application	farmer	0.0001	3388
Strawberries - mixer/loader + groundboom application	farmer	0	10164
Grapes - mixer/loader + airblast application	farmer	0.0002	1004
Stone fruits (peach)[7] mixer/loader + airblast application	farmer	0.0004	587
Stone fruits (cherries)[7]mixer/loader + airblast application	farmer	0.0001	2936

1 Based on individuals wearing a single layer of clothing and gloves, except for groundboom applicators, for whom exposure was estimated based on not wearing gloves. Daily dose = default area treated (ha/day) × application rate (kg a.i./ha) × PHED exposure (µg a.i./kg) × conversion factor (1 mg a.i./1000 µg a.i./kg)/body weight (70 kg)

2 Based on a rabbit developmental study, target MOE = 300

3 Green onions are the representative crop for bulb vegetables

4 Field cucumbers are the representative crop for cucurbit vegetables

5 Field tomatoes are the representative crop for fruiting vegetables

6 Carrots are the representative crop for root vegetables

7 Peaches are the representative crop for stone fruits.

a Closed mixing/loading and application

Table 7 The Re-entry Intervals for Headline EC with 23% Dermal Absorption

Crop(s)	Activities	Transfer Co-efficient ($\mu g/cm^2$)[1]	Re-entry Interval (days) with 23% DA	Default REI (h)
Wheat, barley, rye, chickpeas, lentils and soybean	Scouting and irrigation	1500	0	12
Dry field beans and peas (except soybean)	Hand harvesting	2500	1 (<PHI)	
Edible-podded legume vegetables, and succulent peas and beans	Scouting and irrigation	1500	0	12
Corn	Scouting, hand weeding and irrigation	1000	0	12
	Detasseling and hand harvesting	17 000	7	
Sugar beets	Scouting and irrigation	1500	0	12
Potatoes	Scouting and irrigation	1500	0	12
Alfalfa for seed	Scouting and irrigation	1500	0	12

[1] Agriculture Reentry Task Force (ARTF) Proprietary Transfer Coefficient. The applicant, BASF, is a member of ARTF.

Table 8 The Re-entry Intervals for Cabrio EG with 23% Dermal Absorption

Crop(s)	Activities	Transfer Co-efficient ($\mu g/cm^2$)[1]	Re-entry Interval (days) with 23% DA	Default REI (h)
Green onions (bulb vegetables)[2]	Hand harvesting	2500	3	
	ll other activities	300	0	12
Field cucumbers (cucurbit vegetables)[3]*	Hand harvesting, thinning and hand pruning	2500	3	
	All other activities	1500	0	
Squash	Hand harvesting and leaf pulling	2500	3	
	ll other activities	1500	0	12
Watermelon	Hand harvesting, pruning, thinning and turning	2500	3	
	ll other activities	1500	0	12
Tomatoes (fruiting vegetables)	All activities	1000	0	12
Carrots [5] (root vegetables)	Hand harvesting	2500	3	
	All other activities	300	0	12
Highbush blueberries	Hand harvesting	5000	28	
	ll other activities	1000	0	12
Lowbush blueberries	Hand harvesting and pruning	1500	0	12
	All other activities	400	0	12
Strawberries	Hand harvesting, hand pruning and training	1500	0	12
	Irrigation, scouting, hand weeding	400	0	12

Crop(s)	Activities	Transfer Co-efficient (µg/cm²)[1]	Re-entry Interval (days) with 23% DA	Default REI (h)
Peaches[6] (Stone Fruits)	Hand pruning and thinning	3000	9	
	Hand harvesting	1500	1 (<PHI)	
	ll other activities	1000	0	12
Grapes	Hand harvesting, thinning, training, tying, pruning, leaf pulling	5000	28 (not feasible)	

* Except for squash and watermelon

1 ARTF Proprietary Transfer Coefficient. The applicant, BASF, is a member of ARTF.

2 Green onions are the representative crop for bulb vegetables.

3 Field cucumbers are the representative crop for cucurbit vegetables.

4 Field tomatoes are the representative crop for fruiting vegetables.

5 Carrots are the representative crop for root vegetables.

6 Peaches are the representative crop for stone fruits.

Table 9 Integrated Food Residue Chemistry Summary

CROP FIELD TRIALS ON DRY BULB ONION AND GREEN ONION						PMRA #1088272
Following the original review, the use on bulb vegetables was supported on a conditional basis pending the submission of additional supervised residue trials conducted at GAP in the respective representative Canadian growing regions.						
Newly submitted data to fulfill the data requirement for the conversion to full registration: Field trial data were submitted for pyraclostrobin on the representative crops (dry bulb and green onion) of the bulb vegetables crop group (Crop Group 3). During the 2005 growing season, five trials were conducted on dry bulb onions in Regions 5 (ND, one trial; ON, Canada, two trials) and 5B (QC, Canada, two trials); and two trials were conducted on green onions in Regions 5 (ND, one trial) and 5B (QC, Canada, one trial). At each test location, six broadcast foliar applications of a co-formulation containing boscalid and pyraclostrobin were made to dry bulb and green onions at 0.16–0.18 kg a.i./ha/application, with a 6- to 8-day retreatment interval, for a total rate of ~1.00 kg a.i./ha/season. Mature onions were harvested 6 or 7 days after the last application. It should be noted that only pyraclostrobin residue data are reported herein. The maximum combined residues of pyraclostrobin and metabolite BF 500-3 were 0.89 and 0.77 ppm, respectively, in or on treated samples of dry bulb onions and green onions harvested at the 6- or 7- day PHI.						
Commodity	**Total Rate (kg a.i./ha)**	**Preharvest Interval (days)**	**Residue Levels (ppm)**			
			n	**Min.**	**Max.**	**HAFT**
Combined residues of pyraclostrobin and the metabolite BF 500-3						
Dry bulb onion	~1	6–7	10	<0.040	0.888	0.806
Green onion			4	0.645	0.77	0.708
CROP FIELD TRIALS ON CUCURBIT VEGETABLES					**PMRA #1088273**	
Following the original review, the use on cucurbit vegetables was supported on a conditional basis pending the submission of additional supervised residue trials conducted at GAP in the respective representative Canadian growing regions.						
Newly submitted data to fulfill the data requirement for the conversion to full registration: Field trial data were submitted for pyraclostrobin on the representative crops (cucumber, cantaloupe and summer squash) of the cucurbit vegetable crop group (Crop Group 9). During the 2004 growing season, four trials were						

conducted on cucumber in Regions 2 (GA), 5B (QC, Canada), 10 (CA) and 12 (OR); two trials were conducted on cantaloupe (muskmelons) in Regions 5 (MN) and 5B (QC, Canada); and four trials were conducted on summer squash in Regions 1A (PEI, Canada), 5(MN), 5B (QC, Canada) and 12 (OR).

At each test location, six broadcast foliar applications of pyraclostrobin were made to cucurbits at 0.21–0.25 kg a.i./ha/application, with a 6- to 8-day retreatment interval, for a total rate of ~1.3 kg a.i./ha. The last four applications included another active ingredient, boscalid, as part of a tank mix. Mature cucurbit samples were harvested on the day (0-day PHI) of the last application. It should be noted that only pyraclostrobin residue data are reported herein. The maximum combined residues of pyraclostrobin and metabolite BF 500-3 were 0.19 ppm, 0.38 ppm and 0.21 ppm, respectively, in or on treated cucumber, cantaloupe and summer squash harvested at the 0-day PHI.

Commodity	Total Rate (kg a.i./ha)	Preharvest Interval (days)	Residue Levels (ppm)			
			n	Min.	Max.	HAFT
Combined residues of pyraclostrobin and the metabolite BF 500-3						
Cucumber	1.31–1.35	0	8	0.053	0.186	0.18
Cantaloupe			4	0.099	0.379	0.338
Summer squash			8	0.094	0.213	0.19

CROP FIELD TRIALS ON STONE FRUITS **PMRA #1088274**

Following the original review, the use on stone fruits was supported on a conditional basis pending the submission of additional supervised residue trials conducted at GAP in the respective representative Canadian growing regions.

Newly submitted data to fulfill the data requirement for the conversion to full registration:
Field trial data were submitted for pyraclostrobin on representative crops (peach, plum and cherry) of the stone fruit crop group (Crop Group 12). During the 2004 growing season, four peach trials were conducted in Regions 5 (IL, MN (5A) and ON, Canada, one trial each) and 11 (WA, one trial); four plum trials were conducted in Regions 1A (NS, Canada, one trial), 5 (MN (5A) and ON, Canada, one trial each) and 11 (ID, one trial); and one sweet cherry trial was conducted in Region 11 (WA, one trial).

At each test location (except for the test on cherries), five broadcast foliar applications of a co-formulation containing boscalid and pyraclostrobin were made to stone fruit trees at 0.12-0.15 kg a.i./ha/application, with a 6- to 8-day retreatment interval, for a total rate of ~0.65 kg a.i./ha/season. In the trial on sweet cherries, the treated plot received six broadcast foliar applications of boscalid and pyraclostrobin at ~0.12 kg a.i./ha/ application, with a 7- to 8-day retreatment interval, for a total rate of 0.77 kg a.i./ha/season. Samples of peaches, plums and sweet cherries were harvested immediately (0-day PHI) after the last application. It should be noted that only the pyraclostrobin residue data are reported herein. The maximum combined residues of pyraclostrobin and the metabolite BF 500-3 were 0.65 ppm, 0.49 ppm and 0.79 ppm in or on treated peaches, plums and sweet cherries, respectively, harvested at the 0-day PHI.

Commodity	Total Rate (kg a.i./ha)	Preharvest Interval (days)	Residue Levels (ppm)			
			n	Min.	Max.	HAFT
Combined residues of pyraclostrobin and the metabolite BF 500-3						
Peach	0.65	0	8	0.24	0.647	0.634
Plum	0.65		8	0.069	0.491	0.447
Sweet cherry	0.77		2	0.689	0.789	0.739

CROP FIELD TRIALS ON BERRIES	PMRA #1088275

Following the original review, the use on blueberries was supported on a conditional basis pending the submission of additional supervised residue trials conducted at GAP in the respective representative Canadian growing regions. The use on raspberries was not supported due to efficacy issues. However, newly submitted raspberry data will support setting an MRL on all of Crop Group 13 (berries) to accommodate imported berry crops.

Newly submitted data to fulfill the data requirement for the conversion to full registration:
Field trial data were submitted for pyraclostrobin on the representative crops (raspberry and blueberry) of the berries crop group (Crop Group 13). During the 2004 growing season, three trials were conducted on red raspberry in Regions 5 (MN, one trial), 5B (QC, Canada, one trial) and 12 (OR, one trial); and six trials were conducted on blueberry in Regions 1A (PEI, Canada, one trial; NS, Canada, two trials, each on lowbush blueberries) and 5 (MI (5A), two trials; WI (5A), one trial, each on highbush blueberries).

At each test location, four broadcast foliar applications of a co-formulation containing boscalid (25.2% WG) and pyraclostrobin (12.8% WG) were made to berries at ~0.2 kg a.i./ha/application, with a 6- to 8-day retreatment interval, for a total rate of ~0.83 kg a.i./ha/season. Mature berry samples were harvested on the day (0-day PHI) of the last application. It should be noted that only pyraclostrobin residue data are reported herein. The maximum combined residues of pyraclostrobin and metabolite BF 500-3 were 1.3 ppm and 2.5 ppm, respectively, in or on treated samples of raspberries and blueberries harvested at the 0-day PHI.

Commodity	Total Rate (kg a.i./ha)	Preharvest Interval (days)	Residue Levels (ppm)			
			n	Min.	Max.	HAFT
Combined residues of pyraclostrobin and the metabolite BF 500-3						
Raspberry, red	~0.85	0	6	0.765	1.328	1.279
Blueberry			12	1.104	2.52	2.325

CROP FIELD TRIALS ON FIELD PEAS AND LENTILS	PMRA #1088274

Following the original review, the use on dried shelled pea and bean (except soybean) was supported on a conditional basis pending the submission of a residue standard curve for dry pea seed and lentil crops grown in Zone 14.

Newly submitted data to fulfill the data requirement for the conversion to full registration:
Field trial data were submitted for pyraclostrobin on field peas and lentils. In 2004, one trial was conducted on dried shelled peas in Region 11 (ID, USA). One untreated control plot and one treated plot were established at the test site. The treated plot received two broadcast foliar applications of pyraclostrobin at 213–224 g a.i./ha/application, with a 6-day retreatment interval, for a total rate of 443 g a.i./ha/season. Applications included a non-silicone-based surfactant in the spray mixture. Mature field pea samples (seed) were harvested 22 days after the last application (22-day PHI).

In addition, two trials were conducted at various rates, to generate a residue dose response curve on field peas and lentils grown in Region 14 (Alberta and Saskatchewan). The treated plots received two broadcast foliar applications of pyraclostrobin targeting 50, 100, 200 or 500 g a.i./ha/application. The actual total seasonal rates were 99–100, 197–200, 393–411 and 989–1015 g a.i./ha. The applications were made at 10- or 12-day retreatment intervals. Applications included a non-silicone-based surfactant in the spray mixture. Samples were harvested 31-33 days after the last application.

The results from one supervised crop field trial study on field pea have shown that the combined residues of pyraclostrobin and BF 500-3 were below the combined LOQ (<0.04 ppm) in or on two treated field pea seed samples harvested 22 days after the last of two broadcast foliar applications of pyraclostrobin, totalling 443 g a.i./ha/season.

The results from the supervised crop field trials conducted to generate a residue dose response curve for dry pea seed and lentil crops grown in Region 14 have shown that the maximum combined residues of pyraclostrobin and BF 500-3 were 0.06, 0.10, 0.16 and 0.47 ppm in or on field pea samples (seed) harvested 33 days after the last of two broadcast foliar applications of pyraclostrobin, with a 12-day retreatment interval, totalling 100, 200, 411 and 1015 g a.i./ha/season, respectively.

Maximum combined residues were 0.16, 0.34, 0.65 and 2.46 ppm in or on immature lentil samples (pods and seeds combined) harvested 31 days after the last application of pyraclostrobin at 99, 197, 393 and 989 g a.i./ha/season, respectively. When comparing the results observed in field peas and lentils, it can be concluded that combined residues of pyraclostrobin and BF 500-3 increase with increasing rates, thus a positive dose response relationship exists between residue levels and application rates. However, this linear relationship is not proportional.

Table 10 Food Residue Chemistry Overview of Metabolism Studies and Risk Assessment

PLANT STUDIES	
RESIDUE DEFINITION FOR MONITORING AND MAXIMUM RESIDUE LIMIT **Enforcement method #D9808 (LC-MS/MS)[1] and #D9904 (HPLC-UV)**	Pyraclostrobin and the desmethoxy metabolite BF 500-3 ([2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl] carbamate)
RESIDUE DEFINITION FOR RISK ASSESSMENT	Pyraclostrobin and the desmethoxy metabolite BF 500-3 ([2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl] carbamate)
METABOLIC PROFILE IN DIVERSE CROPS	Potato, grape and wheat: Metabolic pathways and major metabolites are similar in these three dissimilar crops.
ANIMAL STUDIES	
RESIDUE DEFINITION FOR MONITORING AND MAXIMUM RESIDUE LIMIT **Enforcement method #439/0 for livestock (HPLC-UV), #446/1 for ruminant (LC-MS/MS)[2] and #D9902 for poultry matrices (LC-MS/MS)**	Ruminant matrices: pyraclostrobin and the metabolites hydrolyzable to BF 500-5 (1-(4-chlorophenyl)-1*H*-pyrazol-3-ol) and BF 500-8 (1-(4-chloro-2-hydroxyphenyl)-1*H*-pyrazol-3-ol) **Poultry matrices:** pyraclostrobin and the metabolites hydrolyzable to BF 500-5 (1-(4-chlorophenyl)-1*H*-pyrazol-3-ol) and BF 500-9 (1-(3-chloro-4-hydroxyphenyl)-1*H*-pyrazol-3-ol)
RESIDUE DEFINITION FOR RISK ASSESSMENT	**Ruminant matrices:** pyraclostrobin and the metabolites hydrolyzable to BF 500-5 (1-(4-chlorophenyl)-1*H*-pyrazol-3-ol) and BF 500-8 (1-(4-chloro-2-hydroxyphenyl)-1*H*-pyrazol-3-ol) **Poultry matrices:** pyraclostrobin and the metabolites hydrolyzable to BF 500-5 (1-(4-chlorophenyl)-1*H*-pyrazol-3-ol) and BF 500-9 (1-(3-chloro-4-hydroxyphenyl)-1*H*-pyrazol-3-ol)
METABOLIC PROFILE IN ANIMALS (goat, hen, rat)	Similar metabolic profile
FAT SOLUBLE RESIDUE	No

DIETARY RISK FROM FOOD AND WATER			
June 25, 2007 **Chronic Non-Cancer Dietary Risk** **ADI = 0.017 mg/kg bw/day** **EEC = 0.0017 ppm** Chronic dietary exposure analyses were performed in order to determine the exposure and risk estimates that resulted from the use of pyraclostrobin on several crops in Canada, including crops imported into Canada. The assessment used medians, percent crop treated information (chronic), percent import information (acute), experimental processing factors and anticipated residues in animal matrices.	**POPULATION**	**ESTIMATED RISK (% of ADI)**	
		Food (Refined)	**Food + EEC (Refined)**
	Total Population	16.3	16.5
	All infants <1 yr old	24.4	25
	Children 1 to 2 yrs	**31.3**	**31.6**
	Children 3 to 5 yrs	26.2	26.5
	Children 6 to 12 yrs	16.6	16.9
	Youth 13 to 19 yrs	11.6	11.8
	Adults 20 to 49 yrs	15	15.2
	Adults 50+ yrs	16.2	16.4
	Females 13 to 49 yrs	14.4	14.6

Acute Dietary Risk

Population Subgroup	**ARfD (mg/kg/day)**	**95th Percentile Food Only**		**95th Percentile Food Plus Water**	
		%ARfD (Basic)	**% ARfD (Refined)**	**%ARfD (Basic)**	**% ARfD (Refined)**
Females 13–49 years old	0.017	427.7	91.6	432.2	92.8

Table 11 Toxicity to Non-Target Species

Terrestrial Organisms				
Organism	**Exposure**	**Test Substance**	**Endpoint Value**	**Reference (PMRA No.)**
Vascular Plants				
Vascular plant	Seedling emergence	BAS 500 00F (23.6% a.i.)	21-d EC_{25} > 560 g a.i./ha	1087933
	Vegetative vigour	BAS 500 00F (23.6% a.i.)	14-d EC_{25} > 560 g a.i./ha	1087934
Aquatic Organisms				
Freshwater Species				
Daphnia magna	Acute	BF 500-3	48-hr EC_{50} > 92 µg /L 48-hr NOEC = 92 µg /L	1359262
Rainbow trout	Acute	BF 500-3	96-hr LC_{50} > 94.8 µg /L 96-hr NOEC = 94.8 µg /L	1370731
Freshwater alga/diatoms	Green algae - acute (*Pseudokirchneriella subcapitata*)	BF 500-3	96-hr NOEC = 28.6 µg /L 96-hr EC_{50} > 974 µg /L	1359263

Table 12 Screening Level Risk Assessment of Insignia EG Fungicide on Non-Target Species

Organism	Study	LC_{50}/EC_{50} or NOEC	EEC	RQ
Terrestrial Organisms				
Earthworm	Acute	14-d LC_{50} = 567 mg a.i./kg soil	1.257 mg a.i./kg	<1
Bobwhite quail	Dietary	LD_{50} > 5000 mg a.i./kg dw	495 mg a.i./kg dw	<1
Mallard duck	Dietary	LD_{50} > 5000 mg a.i./kg dw	95.66 mg a.i./kg dw	<1
Rat	Acute	LD_{50} = 5000 mg a.i./kg bw	1427 mg a.i./kg dw	<1
	90-d dietary	NOAEL = 50 mg a.i./kg dw	1427 mg a.i./kg dw	29
	Reproduction	NOAEL = 300 mg a.i./kg bw	1427 mg a.i./kg dw	4.8
Mouse	90-d dietary	NOAEL = 50 mg a.i./kg dw	1418 mg a.i./kg dw	28.4
Vascular plant	Seedling emergence	21-d $EC_{25} \geq$ 560 g a.i./ha	2828 g a.i./ha[1]	5
Vascular plant	Vegetative vigour	21-d $EC_{25} \geq$ 560 g a.i./ha	2828 g a.i./ha[1]	5

Organism	Study	LC_{50}/EC_{50} or NOEC	EEC	RQ
Aquatic Organisms				
Daphnia	Acute	48-h LC_{50} = 15.7 µg a.i./L	0.420 mg a.i./L	53.6
	Chronic	21-d NOEC = 4 µg a.i./L	0.420 mg a.i./L	105
Rainbow trout	Acute	96-h LC_{50} = 6.2 µg a.i./L	0.420 mg a.i./L	677
	Chronic	98-d NOEC = 2.35 µg a.i./L	0.420 mg a.i./L	178
Bluegill sunfish	Acute	96-h LC_{50} = 11.4 µg a.i./L	0.420 mg a.i./L	368
Green algae (*Pseudo-kirchneriella subcapitata)*	Acute	96-h EC_{50} = 152 µg a.i./L	0.420 mg a.i./L	5.52
Blue green algae (*Anabaena flosaquae*)	Acute	120 EC_{50} > 1.78 mg a.i./L	0.420 mg a.i./L	<1
Diatoms	Acute	120-h EC_{50} = 1.5 µg a.i./L	0.420 mg a.i./L	560
Mollusk	Shell depostion	96-h EC_{50} = 12.5 µg a.i./L	0.420 mg a.i./L	67.2
Sheepshead minnow	Acute	96-h EC_{50} = 76.9 µg a.i./L	0.420 mg a.i./L	54
	Chronic	36-d NOEC = 10.8 µg a.i./L	0.420 mg a.i./L	38
Fathead minnow	Chronic	NOEC = 4.14 µg a.i./L	0.420 mg a.i./L	101
Mysid	Acute	96-h LC_{50} = 2.12 µg a.i./L	0.420 mg a.i./L	396
Marine algae (*Skeletonema costatum*)	Acute	120 EC_{50} = 65 µg a.i./L	0.420 mg a.i./L	13
Amphibian[2]	Acute (fish)	96-h LC_{50} = 6.2 µg a.i./L	2.24 mg a.i./L	3613

[1] Based on cumulative application on plants.

[2] Based on the endpoint of most sensitive fish.

RQ: risk quotient

Appendix II Supplemental Maximum Residue Limit (MRL) Information - International Situation and Trade Implications

Some of the MRLs differ from the tolerances established in the U.S. and Codex MRLs (40 CFR Part 180, Codex MRLs).

Table 2 Differences Between Canadian MRLs and Other Jurisdictions

Commodity	Canada (ppm)	U.S. (ppm)	Codex* (ppm)
Crop Group 3 - bulb vegetables	0.9	0.9	0.2 (onion bulb)
Crop Group 13 - berries	3.5	4	1.0 (blueberries)
Meat and meat byproducts of poultry	0.1	No U.S. tolerances established on poultry commodities.	0.05
Eggs	0.1	No U.S. tolerances established on poultry commodities.	0.05

* Codex is an international organization under the auspices of the United Nations that develops international food standards, including MRLs.

MRLs may vary from one country to another for a number of reasons, including differences in pesticide use patterns and the locations of the field crop trials used to generate residue chemistry data. For animal commodities, differences in MRLs can be due to different livestock feed items and practices.

Under the North American Free Trade Agreement (NAFTA), Canada, the United States and Mexico are committed to resolving MRL discrepancies to the broadest extent possible. Harmonization will standardize the protection of human health across North America and promote the free trade of safe food products. Until harmonization is achieved, the Canadian MRLs specified in this document are necessary. The differences in MRLs outlined above are not expected to impact businesses negatively or adversely affect international competitiveness of Canadian firms or to negatively affect any regions of Canada.

Appendix III Crop Groups: Numbers and Definitions

Crop Group Number	Name of the Crop Group	Food Commodities Included in the Crop Group
3	Bulb vegetables	dry bulb onions garlic great headed garlic green onions leeks potato onions rakkyo shallots tree onion tops Welsh onion tops
13	Berries	blackberries blueberries currants elderberries gooseberries huckleberries loganberries raspberries

References

A. LIST OF STUDIES/INFORMATION SUBMITTED BY REGISTRANT

1.0 The Active Ingredient, Its Properties and Uses

2.0 Methods of Analysis

3.0 Impact on Human and Animal Health

Toxicology:

PMRA 1087938 2005, BAS 500 F- Subacute Inhalation Study in Wistar Rats: 20 Aerosol Exposures During 4 Weeks Experimental Toxicology and Ecology,, 4010494/96073, DACO: 4.3.6

PMRA 951588 2001, Pyraclostrobin (BAS 500 F): Historical Control Tumor Data, DACO: 4.8

PMRA 951589 2001, Pyraclostrobin (BAS 500 F): Historical Control Tumor Data - Second Submission - Leydig Cell Tumors and Adrenal Cortical Tumors, DACO: 4.8

PMRA 951590 0200, Amended Report: Pyraclostrobin (BAS 500 F): Historical Control Data on Non- Neoplastic Lesions in Chronic Rat Studies, DACO: 4.8

PMRA 951687 2002, Summary Points from BASF Responses to Pyraclostrobin Joint Review, DACO: 4.8

PMRA 951688 2002, Chronic and Oncogenicity Studies with BAS 500 F (Pyraclostrobin): Further Evaluations of Body Weight, Food Consumption and Food Efficiency, DACO: 4.8

Food Residue Assessment:

PMRA 1088016 2005, Independent Laboratory Validation (ILV) of the SOP-PA.0265 for the Determination of BAS 500 F and Its Metabolite BF 500-16 Residues in Animal Tissue - Hen (Heart/Muscle), Report No. BASF Study Code - IPMIS 183901; LAARL RESVAL 847-05, MRID: N/S, DA

PMRA 1088017 2000, Investigation of the Stability of BAS 500 F (Reg. No. 304428) in Sample Materials of Animal Origin Under Usual Storage Conditions, Report No. 35913, MRID: N/S, DACO: 7.3

PMRA 1088018 2005, The Magnitude of Pyraclostrobin Residues in Dry Peas and Lentils (2004 Supplemental Data for US and Canada), NC Report No. 172171, MRID: N/S, DACO: 7.4.1

PMRA 1088019 2001, Freezer Storage Stability of BAS 500 F and BF 500-3 in Plant Matrices Including Processed Commodities, Report No. 66414, MRID: N/S, DACO: 7.4.3

PMRA 1088020 2005, Memorandum from USEPA dated May 5, 2005 regarding Pyraclostrobin - Storage Dates for Confined Rotational Crop Study, N/S, MRID: N/S, DACO: 7.4.3

PMRA 1088272 2005, Magnitude of BAS 510 F and BAS 500 F Residues in Bulb Vegetables After Application of BAS 516 04 F, Report No. BASF Study No. 190537, MRID: N/S, DACO: 7.4.1

PMRA 1088273 2005, The Magnitude of BAS 510 F and BAS 500 F Residues in Cucurbits, Report No. BASF Study No. 190531, MRID: N/S, DACO: 7.4.1

PMRA 1088274 2005, The Magnitude of BAS 510 F and BAS 500 F Residues in Stone Fruit, Report No. BASF Study No. 190555, MRID: N/S, DACO: 7.4.1

PMRA 1088275 2005, The Magnitude of BAS 510 F and BAS 500 F Residues in Berries, Report No. BASF Study No. 190549, MRID: N/S, DACO: 7.4.1

Occupational Exposure:

PMRA 1125878 2000, BAS 500 F Turf Transferable Study in Turf., 97235, MRID: 45118725, DACO: 5.9

PMRA 1125879 1998, Validation of BASF Analytical Method D9803 for the analysis of BAS 500F on cloth matriez for use in the determination of turf transferable residue., 98039 980021, MRID: 45118730, DACO: 5.9

PMRA 1125882 2001, Response to questions from PMRA deficiency review Level C for : BAS 500 F disclodeable Foliar Resi\due Study in Turf., DACO: 5.9

PMRA 1125883 2000, BAS 500 00F and BAS 500 01F: Tank mix uniformity of BAS 500 00F and BAS 500 01F in Simulated spray Tank mixtures, 60174, DACO: 5.9

PMRA 742196 2003, 14C-BAS 500 F - Study of the Dermal Absorption in Rats, Report No. 01B0118/036003, MRID: N/S, DACO: 5.8

4.0 Impact on the Environment

PMRA 1087933 Effects of BAS 500 00 F on seedling emergence and growth of selected non-target terrestrial plants (Tier 1). Laboratory Study No. 46887. Study report date: 18-October-2001. BASF Registration Document No. 2001/5002405. 51 pages. DACO 9.8.4.

PMRA 1087934 Effects of BAS 500 00 F on vegetative vigor of selected non-target terrestrial plants (Tier 1). Laboratory Study No. 46888. Study report date: 18-October-2001. BASF Registration Document No. 2001/5002406. 49 pages. DACO 9.8.4.

PMRA 1359262 Acute toxicity of Reg No. 340266 (metabolite of BAS 500F) to *Daphnia magna* Straus in a 48 hour static test. BASF Study Code 172480. Study report date: 21-December-2006. BASF Registration Document No. 2006/1038907. 20 pages. DACO 9.3.2.

PMRA 1359263 Effect of BF 500-3 (Reg. No. 340266, metabolite of BAS 500F) on the growth of the green alga *Pseudokirchneriella subcapitata*. BASF Study Code 172483. Study report date: 22-December-2006. BASF Registration Document No. 2006/1038445. 31 pages. DACO 9.8.2.

PMRA 1370731 Reg. No. 340266 (metabolite BF 500-3 of BAS 500F): acute toxicity study on the rainbow trout (*Oncorhynchus mykiss*) in a static system over 96 hours. Experimental Toxicology and Ecology. Laboratory Project No. 12F0681/065050. 06-February-2007. BASF Registration Document No. 2007/1010836. 41 pages. DACO 9.5.2.1.

PMRA 1269077 Re: Pyraclostrobin technical fungicide, containing pyraclostrobin Reg. No. 27321 TGAI, Submission Number 2005-3432. 2 pages.

5.0 Value

PMRA 1088015 2005, Submission of Aerial Data to Support Condition of Registration, N/S, MRID: N/S, DACO: 10.2.3.3

PMRA 959218 2000, Insignia Pyraclostrobin (Proposed): TURF SUMMARY, N/S, MRID: N/S, DACO: 10.1

PMRA 959219 2000, Insignia Pyraclostrobin (Proposed): Petition for Application in Turf, DACO: 10.1,10.2,10.2.2,10.2.3.1,10.2.3.3,10.3.1,10.3.2

PMRA 959220 2000, Turf: Trial Abstracts, N/S, MRID: N/S, DACO: 10.2.3.3,10.3.2

PMRA 959221 2001, Response to Questions from PMRA Deficiency review Level C: BAS 500F Value- Turf, N/S, MRID: N/S, DACO: 10.2.3.3

PMRA 959419 2000, Turf: Trial Abstracts, N/S, MRID: N/S, DACO: 10.2.3.3,10.3.2

C. ADDITIONAL INFORMATION CONSIDERED

i) Published Information

Pest Management Regulatory Agency, 2003. Regulatory Note REG2003-06, *Pyraclostrobin, Headline EC, Cabrio EG.* pp. 106.